

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2005-325869

(43)Date of publication of application : 24.11.2005

(51)Int.Cl.

F16D 3/26

B62D 1/20

F16D 1/08

(21)Application number : 2004-142574

(71)Applicant : NSK LTD

(22)Date of filing : 12.05.2004

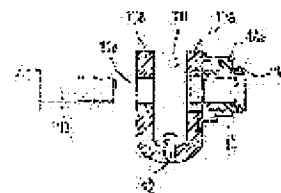
(72)Inventor : TSUBOI YOSHITAKA
ARAI YOJI

(54) UNIVERSAL JOINT AND STEERING DEVICE FOR VEHICLE EQUIPPED WITH THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a universal joint capable of preventing occurrence of axial deviation between a yoke and a shaft and loosening of a tightening bolt, and to provide a steering device for a vehicle equipped with the same.

SOLUTION: After a plane coupling part of a shaft is sandwiched so as to come into contact with the inner surface of a U-shaped coupling part 11a of a yoke 11, a fitting hole (15a) which is a position regulating member formed in a shaft 15 is fitted in a stud pin 12 which is a position regulating member of a U-shaped coupling part 11a of a yoke 11. By inserting a fastening bolt 13 into a through hole 11e to be screwed into a nut 14 arranged ahead thereof, fixing of the yoke 11 and the shaft 15 is completed. The stud pin 12 which is a first position regulating member is fitted in a fitting hole formed in the shaft 15 which is a second position regulating member, thereby materializing accurate positioning of the yoke and the shaft.



Japanese Patent Application laid-open No. 2005-325869

Published: November 24, 2005

*****The attached is a machine translation provided by the JPO database*****

CLAIMS

[Claim(s)]

[Claim 1]

In an adjustable joint which comprises the 1st yoke connected with the 1st axis, the 2nd yoke provided with a polar bond part formed in the shape of [which is connected with the 2nd axis] a section U character, and a spider which combines both the said 1st and 2nd yokes,

Said polar bond part is provided with the 1st position regulation member that regulates an axial position of the 2nd axis fixed to a clamp face formed in the shape of a section U character,

Said 2nd axis is provided with the 2nd position regulation member that fits into said 1st position regulation member.

An adjustable joint by which it is characterized.

[Claim 2]

One position regulation member is a projecting member, and a position regulation member of another side of said 1st position regulation member and the 2nd position regulation member is a cavity member which fits into said projecting member.

The adjustable joint according to claim 1 by which it is characterized.

[Claim 3]

Said 1st position regulation member is the pin implanted in a clamp face formed in the shape of [of said polar bond part] a section U character, and said 2nd position regulation member is a fitting hole which fits into said pin formed in said 2nd axis.

The adjustable joint according to claim 1 by which it is characterized.

[Claim 4]

Said 1st position regulation member is the fitting hole formed in a clamp face formed in the shape of [of said polar bond part] a section U character, and said 2nd position regulation member is the pin implanted in said 2nd axis.

The adjustable joint according to claim 1 by which it is characterized.

[Claim 5]

Said 2nd yoke is provided with a breakthrough which penetrates a polar bond part formed in the shape of a section U character, a polar bond part is bound tight from the

outside with a stacking bolt and a nut to said breakthrough, and fixed combination of the 2nd axis is carried out at said 2nd yoke.

The adjustable joint according to any one of claims 1 to 4 by which it is characterized.

[Claim 6]

When a regular position is not equipped with said 2nd axis in contact with said 1st or 2nd position regulation member, a locating position of said 1st or 2nd position regulation member is determined that a gap is formed between the 2nd axis and a nut. The adjustable joint according to claim 5 by which it is characterized.

[Claim 7]

Said 1st axis is a steering shaft for vehicles, and said 2nd axis is an input shaft of a steering mechanism.

The adjustable joint according to any one of claims 1 to 6 by which it is characterized.

[Claim 8]

In a steering system for vehicles provided with a steering shaft and an input shaft of a steering mechanism, a steering shaft and an input shaft are combined by said adjustable joint according to any one of claims 1 to 6.

A steering system for vehicles by which it is characterized.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

Especially this invention relates to the adjustable joint which combines that steering shaft and input shaft of a steering mechanism about the steering system for vehicles.

[Background of the Invention]

[0002]

In the steering system for vehicles, in order to connect a steering shaft with the input shaft of a steering mechanism, for example, a pinion shaft, the adjustable joint is used.

[0003]

Drawing 9 is a figure explaining an example of the composition of the adjustable joint 100 which connects the conventional steering shaft 110 with the input shaft 112 of a

steering mechanism. In drawing 9, the adjustable joint 100 combines the yokes 101 and 102 of a couple via the spider 103. Four ends of the spider 103 are combined with the yokes 101 and 102 via the needle bearing 103a in which the tip part of the yokes 101 and 102 was provided, respectively, enabling free rotation.

It is constituted so that torque can be transmitted among the yokes 101 and 102 (refer to patent documents 1).

[0004]

When building the above-mentioned adjustable joint 100 into a steering system, carry out fixed combination of one yoke 101 by welding and other means at the end of the steering shaft 110, and combine the yoke 102 of another side with the input shaft 112, for example, but. After such attachment work usually attaches to the body the steering shaft 110 by which fixed combination of the yoke 101 was carried out, The yoke 102 of the structure called a "horizontal ON ** type" is used so that the yoke 102 of another side can be combined with the input shaft 112, without moving the steering shaft 110.

[0005]

Drawing 10 is a figure explaining the composition of the bond part of the yoke of a horizontal ON ** type, and, as for the yoke 102 of a horizontal ON ** type, the section is provided with the bond part 102a of U type.

The breakthrough 102b is formed in one of these, and the screw thread 102c screwed in the stacking bolt 102d is formed in the side which counters this at the bond part 102a of U type.

[0006]

Drawing 11 is a figure explaining the composition of the yoke connection end part of the input shaft 112, the flat-surface bond parts 112a and 112b which deleted the both sides of the axis at the parallel flat surface near [the] the end at the input shaft 112 are formed, and also 112 d of notching is formed near the end of rectangular directions in the flat-surface bond part 112a. 112 d of notching achieves the function to prevent the input shaft 112 from falling out from the yoke 102 to shaft orientations, also if interference with the axis 112 and the stacking bolt 102d should be avoided and the stacking bolt 102d should loosen.

[0007]

The joint procedure of the yoke 102 and the input shaft 112 is explained briefly. First, the yoke 102 and the input shaft 112 are located in the position shown as a solid line

by drawing 9. Next, the position shown with a dashed line by drawing 9 is made to rotate the yoke 102, and as shown in drawing 10, the flat-surface bond parts 112a and 112b of the input shaft 112 are put inside the bond part 102a of U type of the yoke 102. By screwing and binding the stacking bolt 102d tight on the screw thread 102c of the side which inserts the stacking bolt 102d in the breakthrough 102b of the bond part 102a of U type, and counters the breakthrough 102b. The bond part 102a of U type is stuck to the flat-surface bond parts 112a and 112b, and the fixed combination with the yoke 102 and the input shaft 112 is made.

[0008]

Although it ****s to the side which counters the breakthrough 102b of the bond part 102a of U type, 102c is cut with the composition shown in above-mentioned drawing 10 and the nut is omitted with it, it is good also as composition which replaces with the screw thread 102c and uses a nut.

[0009]

The work which combines the input shaft 112 with the above-mentioned yoke 102 of a horizontal ON ** type, In order that the input shaft 112 and the yoke 102 may maintain a regular position and the input shaft 112 may not slip out of the yoke 102 until the fixed combination by the stacking bolt 102d is completed, in order to carry out in narrow space, such as an engine room, it has composition which is explained below.

[0010]

Hereafter, an example of the composition is explained with reference to drawing 11 and drawing 12. It is the sectional view where drawing 11 met the front view of the input shaft 112, and drawing 12 met the L-L line of drawing 11. The steel ball 112f is arranged by the spring material 112g to the hole 112e provided in the flat-surface bond part 112a side of the input shaft 112, enabling free projection / level luffing motion. On the other hand, 102 f (refer to drawing 10) of slots which extended in the input shaft direction where the steel ball 112e provided in the flat-surface bond part 112a of the input shaft 112 is engaged are formed in the bond part 102a of U type of the yoke 102.

[0011]

Although the steel ball 112e is once drawn and the insert lump to the bond part 102a of U type of the input shaft 112 is permitted in the operation which puts the input shaft 112 between the bond part 102a of U type of the yoke 102, If the input shaft 112 is stuffed into the prescribed position of the bond part 102a of U type, The steel ball 112f will be in the state which it fits into 102 f of slots, and shows in drawing 10, the

input shaft 112 is held at the bond part 102a of U type of the yoke 102, and omission are prevented, and the alignment with the input shaft 112 and the yoke 102 is attained.

[Patent documents 1] JP,8-326767,A.

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0012]

As described above, in the adjustable joint provided with the yoke of the conventional horizontal ON ** type. When combining an input shaft or an output shaft (only henceforth an axis) with the bond part of U type of a yoke, in order to carry out alignment of a yoke and an axis, provided the steel ball in which projection/level luffing motion is free in the flat-surface bond part of the axis, and have established the slot where a steel ball is engaged in the inner surface of U type part by the side of a yoke, but. Trouble not only starts manufacture, but composition is complicated and it cannot perform exact positioning of the shaft orientations of a yoke and an axis.

[0013]

If a stacking bolt is bound tight with exact positioning with a yoke and an axis not performed, the inconvenience of the imperfect alignment of a yoke and an axis occurring and the slack of a stacking bolt occurring will occur. This invention solves an aforementioned problem and an object of an invention is to provide the steering system for vehicles provided with the adjustable joint provided with the combined constitution which can perform exact positioning of the shaft orientations of a yoke and an axis with easy composition, and its adjustable joint.

[Means for Solving the Problem]

[0014]

This invention solves an aforementioned problem and an invention of claim 1, In an adjustable joint which comprises the 1st yoke connected with the 1st axis, the 2nd yoke provided with a polar bond part formed in the shape of [which is connected with the 2nd axis] a section U character, and a spider which combines both the said 1st and 2nd yokes, It is an adjustable joint, wherein said polar bond part was provided with the 1st position regulation member that regulates an axial position of the 2nd axis fixed to a clamp face formed in the shape of a section U character and said 2nd axis is provided with the 2nd position regulation member that fits into said 1st position regulation member.

[0015]

And one regulating member is a projecting member and said 1st regulating member and the 2nd regulating member are cavity members to which a regulating member of

another side fits into said projecting member.

[0016]

And said 1st position regulation member is the pin implanted in a clamp face formed in the shape of [of said polar bond part] a section U character, and said 2nd position regulation member is good to consider it as a fitting hole which fits into said pin formed in said 2nd axis.

[0017]

Said 1st position regulation member is the fitting hole formed in a clamp face formed in the shape of [of said polar bond part] a section U character, and said 2nd position regulation member is good also as a pin implanted in said 2nd axis.

[0018]

Said 2nd yoke shall be provided with a breakthrough which penetrates a polar bond part formed in the shape of a section U character, shall bind a polar bond part tight from the outside with a stacking bolt and a nut to said breakthrough, and shall carry out fixed combination of the 2nd axis at said 2nd yoke.

[0019]

When a regular position is not equipped with said 2nd axis in contact with said 1st or 2nd position regulation member, a locating position of said 1st or 2nd position regulation member shall be determined that a gap is formed between the 2nd axis and a nut.

[0020]

Said 1st axis may be a steering shaft for vehicles, and said 2nd axis may be an input shaft of a steering mechanism.

[0021]

In a steering system for vehicles with which an invention of claim 8 was provided with a steering shaft and an input shaft of a steering mechanism, A steering shaft and an input shaft are steering systems for vehicles combining by said adjustable joint according to any one of claims 1 to 6.

[Effect of the Invention]

[0022]

Since the 2nd position regulation member that fits into the 2nd axis again the 1st position regulation member that regulates the axial position of the 2nd axis at the 1st position regulation member was provided in the axial clamp face of the polar bond part according to the adjustable joint of this invention, exact positioning with a yoke and an axis can be performed.

[0023]

The un-proper work which binds a stacking bolt tight by this as exact positioning with a yoke and an axis cannot be performed is lost, and the quality adjustable joint which can prevent beforehand inconvenience, such as generating of the imperfect alignment of a yoke and an axis and generating of a stacking bolt of slack, can be provided.

[0024]

According to the steering system for vehicles provided with the adjustable joint of this invention, the quality steering system for vehicles which inconvenience, such as generating of the imperfect alignment of a yoke and an axis and generating of a stacking bolt of slack, does not generate can be provided.

[Best Mode of Carrying Out the Invention]

[0025]

Hereafter, this embodiment of the invention is described as an adjustable joint to which it is applied by the steering system for vehicles.

[0026]

The adjustable joint of this embodiment of the invention is provided with the yoke of a horizontal ON ** type previously explained with reference to drawing 9, and the characterizing portion of an invention is in the composition of the connecting part of the yoke of a horizontal ON ** type, and an axis. Entire configurations other than the connecting part of the yoke of a horizontal ON ** type, and an axis (this embodiment input shaft), i.e., the entire configuration of the adjustable joint which combined the yoke of the couple via the spider, Since it is not different from the thing of conventional technology previously explained with reference to drawing 9, explanation is omitted here, and the composition of the connecting part of the yoke (henceforth a yoke) of a horizontal ON ** type and an axis is explained.

[0027]

Drawing 9 may be referred to for the composition of those other than a connecting part with a yoke axis if needed. At this time, the yoke 11 of a 1st embodiment of this invention and the axis 15 are equivalent to the yoke 102 of drawing 9, and the axis 112, respectively, and since the 2nd yoke 21 and axis 25 of an embodiment are equivalent to the yoke 102 of drawing 9, and the axis 112, respectively, I want them to read and understand the numerals of a drawing.

[0028]

[A 1st embodiment]

Drawing 1 thru/or drawing 3 are the figures explaining the adjustable joint of a 1st embodiment of this invention, and drawing 1 is the front view which looked at the yoke from width, and shows the notch **** section for the part about near the pin

established in that bottom. The sectional view of a yoke where drawing 2 met the A-A line of drawing 1, and drawing 3 are the front views near the bond part of the axis combined with a yoke.

[0029]

As shown in drawing 1 and drawing 2, the yoke 11 comprises the bond part 11a by which the whole was formed in section U type, and the spider fitting part 11b extended from the bond part 11a. The spider fitting part 11b is equipped with the needle bearing which 11 d of breakthroughs are provided and do not illustrate, and it is not different from conventional technology to a needle bearing that the end of the spider by which this is not illustrated, either is held enabling free rotation.

[0030]

The breakthrough 11e by which the stacking bolt 13 is inserted in one of these is formed in the bond part 11a of U type, 11 f of breakthroughs are formed also in the side which counters this, and the nut 14 screwed in the stacking bolt 13 is supported movably by the nut electrode holder 14a, and is arranged at 11f of breakthroughs. It is an O ring which carries out tentative holding until the nut 14 screws 14b in the stacking bolt 13.

[0031]

The thickset pin 12 which is the 1st position regulation member is being fixed to the bottom of the bond part 11a, and the tip of the thickset pin 12 is projected to the inner surface of U type of the bond part 11a.

[0032]

Drawing 3 is a front view showing the composition near the bond part of the axis 15, and the fitting hole 15a which is the 2nd position regulation member that fits into the thickset pin 12 of the bottom of the bond part 11a of said yoke 11 is formed in the axis 15. In addition, the flat-surface bond parts 15b and 15c which deleted the both sides of the axis 15 at the parallel flat surface are formed near [the] the end at the axis 15, and also 15 d of notching is formed near the end of rectangular directions in the flat-surface bond parts 15b and 15c. 15 d of notching achieves the function to prevent the axis 15 from falling out from the yoke 11 to shaft orientations, also if interference with the axis 15 and the stacking bolt 13 should be avoided and the stacking bolt 13 should loosen.

[0033]

In the above composition, the joint procedure of the yoke 11 and the axis 15 is explained briefly. First, the yoke 11 and the axis 15 are arranged to a joint ready position (position shown as a solid line in drawing 9). Next, the yoke 11 is rotated (in

drawing 9, it rotates in the position shown by a dotted line), the flat-surface bond parts 15b and 15c of the axis 15 are put so that the medial surface of the bond part 11a of U type of the yoke 11 may be contacted, and the fitting hole 15a formed in the axis 15 is made to fit into the thickset pin 12 of the bond part 11a of U type. Then, the stacking bolt 13 is inserted in the breakthrough 11e, and combination with the yoke 11 and the axis 15 is completed by making it screw in that nut 14 arranged previously.

[0034]

The physical relationship between the nut 14 held at the yoke 11, and the thickset pin 12 and the axis 15, In the state (it is not a normal assembly state) where the axis 15 was inserted and planted in the bond part 11a of U type of the yoke 11 from right-hand side by drawing 4, and the end face of the axis 15 contacted the right lateral of the pin 12 as shown in drawing 4, The opening m shall be maintained between the lateral surface of the nut 14, and the axis 15, it shall plant with the nut 14 so that it may not interfere mutually, and a relative position with the pin 12 shall be determined.

[0035]

According to this composition, the connecting position of the shaft orientations of the yoke 11 and the axis 15 can be easily become final and conclusive in a regular position, and except the axial position where the yoke 11 and the axis 15 are regular, since it cannot assemble, the error in the assembly operation based carelessly can be prevented beforehand.

[0036]

[A 2nd embodiment]

Drawing 5 thru/or drawing 7 are the figures explaining the adjustable joint of a 2nd embodiment of this invention, drawing 5 is the front view which looked at the yoke from width, and near the pin fitting hole established in that bottom shows the notch **** section for the part. The sectional view of a yoke where drawing 6 met the B-B line of drawing 5, and drawing 7 are the front views near the bond part of the axis combined with a yoke.

[0037]

As shown in drawing 5 and drawing 6, the yoke 21 comprises the bond part 21a by which the whole was formed in section U type, and the spider fitting part 21b extended from the bond part 21a. The spider fitting part 21b is equipped with the needle bearing which 21 d of breakthroughs are provided and do not illustrate, and it is not different from conventional technology to a needle bearing that the end of the spider by which this is not illustrated, either is held enabling free rotation.

[0038]

The breakthrough 21e by which the stacking bolt 23 is inserted in one of these is formed in the bond part 21a of U type, 21 f of breakthroughs are formed also in the side which counters this, and the nut 24 screwed in the stacking bolt 23 is supported movably by the nut electrode holder 24a, and is arranged at the breakthrough 21e. It is an O ring which carries out tentative holding until the nut 24 screws 24b in the stacking bolt 23.

[0039]

The pin fitting hole 22 which is the 1st position regulation member is formed in the bottom of the bond part 21a.

[0040]

Drawing 7 is a front view showing the composition near the bond part of the axis 25, and to the medial axis of the axis 25, the connection pin 26 which is the 2nd position regulation member that fits into the pin fitting hole 22 of the bottom of the bond part 21a of said yoke 21 projects on the axis 25 vertically, and is planted in it. In addition, the flat-surface bond parts 25b and 25c which deleted the both sides of the axis 25 at the parallel flat surface are formed near [the] the end at the axis 25, and also 25 d of notching is formed near the end of rectangular directions in the flat-surface bond parts 25b and 25c. 25 d of notching achieves the function to prevent the axis 25 from falling out from the yoke 21 to shaft orientations, also if interference with the axis 25 and the stacking bolt 23 should be avoided and the stacking bolt 23 should loosen.

[0041]

In the above composition, the joint procedure of the yoke 21 and the axis 25 is explained briefly. First, the yoke 21 and the axis 25 are arranged to a joint ready position (position shown as a solid line in drawing 9). Next, the yoke 21 is rotated (in drawing 9, it rotates in the position shown by a dotted line), and the flat-surface bond parts 25b and 25c of the axis 25 are put between the bond part 21a of U type of the yoke 21. The connection pin 26 provided in the axis 25 is made to fit into the fitting hole 22 of the bond part 21a of U type of the yoke 21 at this time. Then, the stacking bolt 23 is inserted in the breakthrough 21b, and combination with the yoke 21 and the axis 25 is completed by making it screw in that nut 24 arranged previously.

[0042]

The physical relationship between the nut 24 held at the yoke 21, and the connection pin 26 provided in the axis 25, In the state (it is not a normal assembly state) where the axis 25 was inserted in the bond part 21a of U type of the yoke 21 from right-hand side by drawing 8, and the left lateral of the connection pin 26 contacted the right end

surface of the bond part 21a of U type as shown in drawing 8, The opening m shall be maintained between the lateral surface of the nut 24, and the axis 25, and it shall be determined that the relative position of the nut 24 and the connection pin 26 will not interfere mutually.

[0043]

Also by this composition, the connecting position of the shaft orientations of the yoke 21 and the axis 25 can be easily become final and conclusive in a regular position, and except the axial position where the yoke 21 and the axis 25 are regular, since it cannot assemble, the error in the assembly operation based carelessly can be prevented beforehand.

[Industrial applicability]

[0044]

The adjustable joint of this invention is what is applied to the steering system for vehicles, Since the 2nd position regulation member that fits into the 1st position regulation member the 1st position regulation member that regulates the axial position of the 2nd axis at the 2nd axis was provided in the axial clamp face of the polar bond part, Exact positioning with a yoke and an axis can be performed and inconvenience, such as generating of the imperfect alignment of a yoke and an axis and generating of a stacking bolt of slack, can be prevented beforehand.

[Brief Description of the Drawings]

[0045]

[Drawing 1]The front view showing a notch **** section for some adjustable joints of a 1st embodiment of this invention.

[Drawing 2]The sectional view of a yoke which met the A-A line of drawing 1.

[Drawing 3]The front view near the bond part of the axis combined with a yoke.

[Drawing 4]A nut, a thicket pin, and the figure explaining the physical relationship between axes.

[Drawing 5]The front view showing a notch **** section for some adjustable joints of a 2nd embodiment of this invention.

[Drawing 6]The sectional view of a yoke which met the B-B line of drawing 5.

[Drawing 7]The front view near the bond part of the axis combined with a yoke.

[Drawing 8]A nut, a thicket pin, and the figure explaining the physical relationship between axes.

[Drawing 9]The figure explaining an example of the composition of the conventional adjustable joint.

[Drawing 10]The figure explaining the integrated state of the yoke of an adjustable

joint and axis which are shown in drawing 9.

[Drawing 11]The front view showing the composition of an axis.

[Drawing 12]The sectional view which met the L-L line of the axis shown in drawing 11.

[Description of Notations]

[0046]

11 Yoke

11a Bond part

11b Spider fitting part

11 d Breakthrough

11e and 11f Breakthrough

12 Thicket pin

13 Stacking bolt

14 Nut

14a Nut electrode holder

14b O ring

15 Axis

15a Fitting hole

15b and 15c Flat-surface bond part

15d notching

21 Yoke

21a Bond part

21b Spider fitting part

21 d Breakthrough

21e and 21f Breakthrough

22 Pin fitting hole

23 Stacking bolt

24 Nut

24a Nut electrode holder

24b O ring

25 Axis

25b and 25c Flat-surface bond part

25d notching

26 Connection pin
